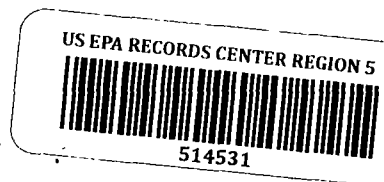


MICHAEL R. HARRIS
Industrial Processes Engineer



Education

M.S. Sanitary Engineering, Oregon State University
B.S. Civil Engineering, Oregon State University.

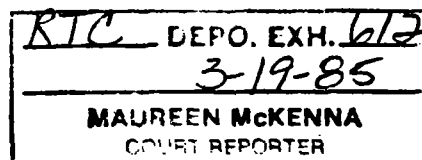
Experience

Mr. Harris is a senior project manager in CH2M HILL's Industrial Processes Division. He has managed a wide variety of projects involving both biological and physical-chemical treatment of water and wastewater for industrial clients. He has overseen all of CH2M HILL's Midwestern solid and hazardous waste remedial planning work under the Superfund program and, in addition, has personally managed several private-sector remedial planning projects.

Mr. Harris' industrial experience includes clients in base metals mining and milling, pulp and paper, industrial chemicals, food processing, and chemical products formulation. He is a recognized firmwide consultant in biological kinetics, sludge dewatering, pilot plant data analysis and scaleup, remedial planning for hazardous waste sites, and similar, related fields. He was coauthor of CH2M HILL's in-house computer program for analysis of biological pilot plant data.

For the Minnesota Pollution Control Agency, Mr. Harris managed CH2M HILL's evaluation of groundwater treatment technologies and water supply alternatives for the City of St. Louis Park, Minnesota. The City's water supply aquifer is contaminated with polynuclear aromatic hydrocarbons emanating from the Reilly Tar and Chemical site, designated as Minnesota's highest priority Superfund site. CH2M HILL's work on this project included quantification of PAH removals at the low nanogram per liter (part per trillion) levels. Technologies evaluated included chlorine, chlorine dioxide, hydrogen peroxide, ozone, peroxide/UV, ozone/UV, macroreticular resins, and granular activated carbon. Based on the results of bench and pilot scale tests and an economic comparison with other water supply alternatives, CH2M HILL recommended treatment of contaminated groundwater with activated carbon and use of treated water in St. Louis Park's potable water system.

As project manager of field investigations, Mr. Harris was responsible for evaluation of a hazardous waste surface storage facility that included analysis of saturated and unsaturated subsurface soils and groundwater which were contaminated with a wide variety of industrial chemicals. He was also a process consultant on the study and design of a



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pressure/vacuum unloading system for processing hazardous wastes at a rail car cleaning facility.

For the first 20 months of CH2M HILL's Superfund contract with EPA, Mr. Harris was in charge of all remedial planning projects tasked to CH2M HILL from EPA Region V, the most active region in Zone II. During this time period, he held direct responsibility for project staffing, execution, and quality control for over 70 simultaneous projects. During the 20-month period, CH2M HILL's level of effort in Region V rose to over 5,000 hours per month. Subcontract costs, including both professional A/E subcontractors and construction subcontractors, were as high as \$1,500,000 per month. In addition to his oversight role on specific projects, Mr. Harris was in charge of establishing and monitoring the performance of administrative procedures for quality control reviews, project audits, interface with the National Contract Laboratory Program, data management programs, and for acquiring A/E subcontractors.

His project experience includes pilot scale evaluation and/or design of the following biological treatment processes: aerated lagoon, activated sludge, pure oxygen activated sludge, rotating biological contactors, anaerobic filter, upflow anaerobic sludge blanket, powdered activated carbon treatment, and a variety of land application techniques.

Similar project experience with physical-chemical treatment processes includes lime, lime-soda, and lime-sodium sulfide softening, dual and mixed-media filtration, reverse osmosis, chemical oxidation, granular activated carbon, ion exchange, air stripping, resin adsorption, vapor compression evaporation, and crystallization.

Mr. Harris has assisted a number of clients in dealing with the public and with agencies. He has appeared at public meetings and has assisted with permit negotiations with local, state, and federal agencies.

He has served as management consultant and process troubleshooter for a number of industrial treatment systems. He has provide services during construction, prepared O&M manuals, and provided operator training and assistance during startup of a number of wastewater treatment systems.

-Mr. Harris has served in numerous capacities on both biological and physical-chemical pilot plants. He has been onsite pilot plant operator, project manager, project consultant, and supervisor of data analysis.

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Representative examples of Mr. Harris's experience with the mining and milling industry are his projects for Anaconda and Exxon Minerals Company. He managed zero-discharge evaluations for both the Anaconda reduction works and for Anaconda's Butte Operations. For Exxon, he managed a series of projects for a grass roots copper, lead, and zinc mine/mill near Crandon, Wisconsin. These projects included development of a water balance for the facility, preparation of a computer model to predict water quality under a number of operating scenarios, and preparation of conceptual designs for process and domestic water treatment systems. The process water (mine water and recycle water) treatment system is believed to be one of the most sophisticated treatment systems, world wide, ever proposed for a mine/mill facility. Special environmental considerations necessitated the use of lime-soda softening, dual media filtration, reverse osmosis, vapor compression evaporation, and a crystallizing evaporator for the final brine product.

In the pulp and paper industry, Mr. Harris has designed an aerated lagoon for Georgia Pacific's mill in Toledo, Oregon, belt press sludge dewatering facilities for Longview Fibre and Blandin Paper Company/City of Grand Rapids, Minnesota, and a UNOX plant for Fibreboard Corporation Mill in Antioch, California. He has also served as project manager/engineer on pilot plant operations at five mills.

In the area of industrial chemicals, Mr. Harris was a project manager for the study and/or design of physical-chemical and biological wastewater treatment facilities at General American Transportation Corporation's (GATX) railroad tank car cleaning facilities in Masury, Ohio, East Chicago, Indiana, and Hearne, Texas; and for the study and design of industrial wastewater pretreatment facilities for all miscellaneous wastes generated at the Trident Support Site, U.S. Navy, Bangor, Washington.

With extensive experience in food processing, Mr. Harris served as project manager for the design of improvements to spray irrigation facilities for Ore-Ida Foods, Inc., in Greenville, Michigan, and Friday Canning Corporation, New Richmond, Wisconsin. He was responsible for the evaluation of improvements to wastewater treatment facilities at corn wet milling plants for the Hubinger Company, Keokuk, Iowa, and Penick & Ford, Cedar Rapids, Iowa.

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Mr. Harris was also responsible for project management/consultant/engineering on a variety of wastewater treatment projects in the food processing industry which included vegetable canning, malting, fruit processing, potato processing, mushroom production, fish processing, meat packing and snack foods.

Prior to his employment with CH2M HILL, Mr. Harris served as a plant engineer at a major oil refinery in Anacortes, Washington.

Professional Registration

Professional Engineer, Oregon, Washington, Wisconsin, Michigan, Minnesota, Indiana, Ohio

Membership in Professional Organizations

Water Pollution Control Federation - Industrial Wastes
Committee - Program Committee
TAPPI - Lake States Chapter
National Society of Professional Engineers
Wisconsin Society of Professional Engineers

Publications and Presentations

"Removal of Polynuclear Aromatic Hydrocarbons from Contaminated Groundwater," coauthored with Michael J. Hansel. Presented at the 4th National Conference on Management of Uncontrolled Hazardous Waste Sites, November 1983.

"Integrated Water Reuse in Mineral Processing Facilities," presented at AIME Annual Meeting. Atlanta, Georgia. March 8, 1983.

"CM - The Fast Track for Minimizing Inflation," Pollution Engineering, June 1980.

"Joint Treatment of Municipal and Fruit Processing Wastewaters in an ABF-Activated Sludge Treatment System," Paper presented at the PNPCA annual meeting, 1977.

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